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NOTE

Note on Stoneflies (Plecoptera), Particularly *Prostoia besametsa* (Ricker) (Nemouridae), in the Diet of Salmonids from the Headwaters of the Middle Fork of the South Platte River, Colorado

A previous report (Duffield and Nelson 1993. Aquatic Insects 15: 141–148) noted that profiles of salmonid diet can provide useful information about the relative abundance and the life history of the prey items consumed. An example of this approach was a recent investigation of stoneflies, particularly *Prostoia besametsa* (Ricker) (Nemouridae), in the diet of three Rocky Mountain salmonid species during a limited period of the year. *Prostoia besametsa* is an abundant species, often exhibiting high population densities in lowland creeks throughout its range (Baumann et al. 1977. Memoirs of the American Entomological Society 31: 1–208). A few studies have listed nemourid stoneflies in the diet of salmonids (Allan 1978. Verhandlungen der internationalen Vereinigung fur Limnologie 20: 2045–2050; McNicol et al. 1985. Environmental Biology of Fishes 12: 219–229; Hubert and Rhodes 1989. Hydrobiologia 178: 225–231; Duffield and Nelson 1993), but none reported this species.

The study area was upstream of the junction of Mosquito Creek and the Middle Fork of the South Platte River, north of Fairplay (Park County), Colorado (39°15′N, and 106°04′W). A total of 38 salmonids consisting of the brook trout (*Salvelinus fontinalis* Mitchell), brown trout (*Salmo trutta* L.) and cutthroat trout (*Oncorhynchus clarki* Richardson) were sampled on six separate days from May 29 through June 10, 1992. The fish were collected during the late morning and early afternoon using artificial dry flies. Stomach contents were collected with a pump (Duffield and Nelson 1993), placed into 4 dram vials and preserved with 70% ethanol. Each salmonid was measured and released unharmed.

Stoneflies in the samples were identified to species whenever possible. Some partially digested adults and immatures could be identified only to the family or genus. All other insects were identified to order. Material is maintained in the authors' collections.

The lengths of the three salmonid species sampled ranged from 160 mm to 290 mm. A total of 2192 specimens were recovered from 38 stomach samples, for an average of 58 insect specimens per sample. Stoneflies were the most abundant insect order in the diet (46% of recovered items, Table 1). All but one sample contained at least one stonefly, and one sample contained eleven stonefly species. Five families and eleven genera of stoneflies were identified (Table 2). All have been reported in this drainage (Ward and Kondratieff 1992. University Press of Colorado, Niwot. 191 pp.).

Duffield and Nelson (1993) found that stoneflies are important in the diet of brown trout and rainbow trout during winter and spring in a mid-Atlantic stream. They speculated that since many North American stonefly species undergo nymphal diapause in the summer and emerge from winter to early summer, they are readily available for

Table 1. Insect orders recovered from salmonid stomach samples taken from the Middle Fork of the South Platte River, Colorado.

Order	% of Total Specimens
Plecoptera	46.6
Diptera	22.3
Ephemeroptera	10.4
Trichoptera	9.4
Hemiptera	5.7
Hymenoptera	3.1
Coleoptera	0.8

Table 2. Plecoptera recovered from salmonid stomach samples taken from the Middle Fork of the South Platte River, Colorado.

Family Species	Nymph			Adult			Total
	Male	Female	Unknown	Male	Female	Exuvium	
Capniidae							
Capnia confusa	—	—	—	—	6	—	6
Nemouridae							
Prostoia besametsa	330	548	92	4	3	2	979
Zapada haysi	—	—	1	—	—	—	1
Chloroperlidae							
Suwallia sp.	—	—	12	—	—	—	12
Sweltsa sp.	—	—	7	—	—	—	7
Chloroperlidae sp.	—	—	1	—	—	—	1
Perlodidae							
Cultus aestivalis	—	—	3	—	—	—	3
Isoperla fulva	—	—	1	—	—	—	1
I. quinquepunctata	—	—	5	—	—	—	5
Kogotus modestus	—	—	2	—	—	—	2
Megarcys signata	—	2	1	—	—	—	3
Pteronarcyidae							
Pteronarcella badia	—	3	—	—	—	—	3
Total							1023

fish consumption only during this latter period of the year. This hypothesis is consistent with stoneflies being a dominant prey item of the Rocky Mountain salmonids examined in this study during late May and early June.

Approximately 96% of the stoneflies recovered were *Prostoia besametsa* (Nemouridae). The sample with the largest number of stonefly specimens contained 163 individuals, 161 of which were *P. besametsa.* Nearly all the individuals of *P. besametsa* recovered from the samples were late-instar nymphs (Table 2). Only a few adults were present in the samples even though they were abundant along the river margins and were frequently observed flying over the river. Radford and Hartland-Rowe (1971. Canadian Journal of Zoology 43: 1812–1817) reported a late April to July emergence for an Alberta population of *P. besametsa* and Hassage and Stewart (1990. Southwest Naturalist 35: 130–134) reported a late April to May emergence for a New Mexico population. It is possible that during the period of this study the late-instar nymphs of *P. besametsa* were intercepted by the salmonids in the water column or on the water surface as they were about to emerge. The female-biased sex ratio of 1M: 1.66F late-instar nymphs indicates, as has been reported for other stoneflies (Hynes 1976. Annual Review of Entomology 15: 25–42), that seasonal emergence of this species is protandrous with male emergence peaking slightly ahead of that of the females.

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